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final paroxysm of upheaval set in, producing a further rise of from three thousand to four thousand feet. The faults, which are strictly correlated with the varying uplifts of the several minor plateaus, again increased their displacement; and at the same time, or shortly afterward, the volcanic forces resumed their activity, producing cones of eruption which still display their characteristic form. These, and the lavas erupted from them, afford evidence, that, though the cañon had at the time a considerable depth, the greater part of its excavation still remained to be affected by that last great effort of corrasive action which has only lately come to an end.

It is believed that the elevation of the plateau region has now ceased, and that the rivers have again nearly reached a base level of erosion. Some, at least, of the faults cut the older basalts; but no evidence has been found, where the newer lavas cross them, of any renewed movement. The glacial period passed over this region without leaving any traces of ice-action, manifesting its occurrence merely as a pluvial episode, very brief in comparison with the stages of the great erosion, but of which some effects may nevertheless be traced.

Such is a very brief and necessarily imperfect outline of the train of reasoning in which the author follows out the exceptional processes which have acted in the Grand Cañon district, and eventuated in producing its present remarkable features. Very few of the conclusions arrived at are open to any question; and, though it has been for so short a time known to science, it may be considered as one of the most fully thought out of geological problems. Among the collateral facts illustrated in this region are several, which, from their apparently anomalous character, are of special interest to the student of dynamical geology. Such is the want of coincidence between the great faults and points of volcanic eruption, the bending-down of the strata along the dropped sides of the faults, the connection of the latter with the peculiar monoclinical flexures, the not uncommon reversal in direction of throw in the opposite ends of a single fault, and the remarkable observation that the general light dip of the strata is increased notably at the bases of the terraces. The last-named circumstance the author is disposed to connect, though doubtfully, with the theory of plastic equilibrium in the earth's crust, — a theory which we believe few geologists will be ready to follow so far.

A notice of this monograph would be incomplete without special reference to the accom-

panying atlas, containing geological maps and panoramic views of the district. The latter, together with a number of illustrations in the volume itself, are from the pencil of Mr. W. H. Holmes, and convey a better idea of the proportions and intricacy of the physical features than could be accomplished by any word-painting, however elaborate.

If the character of the critic must be maintained in reviewing this work, which in its main features demands our praise alone, it may be suggested that the 'effusive' style adopted in some of the chapters is scarcely in keeping with the incomparable dignity of the subject, and is not likely to appeal to the specialists for whom this class of publication is intended.

THE BACILLUS OF BERIBERI.

Etiologia e genesis do beriberi. Pelo Dr. J. B. DE LACERDA. Rio de Janeiro, *Faro & Lino*, 1884. 68 p., illustr. 8°.

THIS pamphlet gives the results of a medicobiological study, carried on in the physiological laboratory of the National museum of Rio de Janeiro, on a very obscure disease, which, introduced many years ago in Brazil from India, carries off annually a large number of victims, particularly in the northern provinces of the empire.

Employing the method of Pasteur, and introducing blood of beriberi patients in meat-solution, Dr. Lacerda obtained in numerous experiments a microphyte similar in form to the bacillus of carbuncle. This organism, which reproduces itself by segmentation and by spores, was also found in the fresh urine and blood of beriberi patients, the spores being at times extremely abundant in the blood. On making subcutaneous injections of the liquid in which the organisms were cultivated, in rabbits and guinea-pigs, these animals were found to succumb in periods of from five to twenty days, some of them presenting a true paralysis of the posterior members; others, a notable weakening of these members, with difficulty of locomotion, and loss of cutaneous sensibility. Death in many cases was caused by asphyxia, the paralysis having extended to the anterior members. The cultivated blood of these animals reproduced the same microphytes that had been obtained from the blood of beriberi patients. The microscopic examination of the spinal medulla and of the muscles revealed the presence of the microphyte and of its spores, their abundance in the medulla being especially remarkable.

From these facts the author draws the logical conclusion, that beriberi is a parasitic disease, and that the parasites attack particularly the blood, muscles, and medulla. In seeking the origin of the parasite, it was found that similar organisms were found at times in rice-grains. The characteristics of the grains of rice attacked by the parasite are given; and the hypothesis is advanced, that rice is often the vehicle of the microphyte by which it enters the human system, which appears to be in accord with the fact that rice is a principal article of food in the regions subject to the disease.

Contaminated grains of rice, subjected to the same cultivation as the blood of beriberi patients, produced organisms entirely identical in appearance. Injections of the liquid of the rice-culture in guinea-pigs produced death in thirteen, seventeen, and twenty days, with paralytic phenomena, and death by asphyxia; and the microscopic examination of the spinal medulla and muscles showed the presence of the same organisms found in animals inoculated with the blood-culture of beriberi. The author proposes to continue his investigation of the suspected relation between a rice diet and beriberi.

BIOLOGICAL THEORIES OF AN ARTIST.

Morphology. Estimates of intelligence. Vital chemistry. By FRANK B. SCOTT, artist. Buffalo, Bigelow pr., 1883. 16 p. 8°.

THE author says in his preface, "If we fail in proving the truth of what we advance, our labor will not be lost: we may lead the way to further discoveries. Columbus was mistaken in his seeking another way to India, but his mistake led to the discovery of a new continent." In science great continents of knowledge never have been discovered by ignorant adventurers: we therefore do not believe that Mr. Scott will achieve the important success he dreams of, although he is mistaken in perhaps half his statements. We are acquainted with no other publication, purporting to be scientific, which contains so many amusing errors and entertaining hypotheses in so few pages. We need only give the following extracts in our justification. "Without oxygen, hydrogen, nitrogen, and carbon, we have no knowledge of life. . . . There are other elements subordinate to these. There is also some other element not subordinate. . . . Perhaps this fifth element was the *quint*-essence of the ancients. Huxley, in his 'Biology,' calls it electricity." Will the author kindly refer us to authority on the quintessence of life of

the ancients; also to the page of Huxley? He further states that the blood at one moment is red with oxygen; the next, black with carbon. We have no doubt that sufficient carbon might blacken the blood, but we are surprised to learn that the mixture occurs regularly during life. The whole pamphlet resembles these samples.

THE ILLINOIS GEOLOGICAL REPORT.

Geological survey of Illinois. A. H. WORTHEN, director. Vol. vii., Geology and paleontology. Springfield, State, 1883. 4+373 p., 31 pl. 8°.

THE first two volumes of this series of reports appeared in 1866; and the others have followed at intervals since then, the seventh having appeared during the past year. The leading feature of these reports is paleontology, in connection with which the names of some of the ablest American paleontologists appear.

In his preface to the present volume, Mr. Worthen says, that to complete the paleontology of the state upon the plan originally contemplated will require two volumes more, with from forty to fifty plates of illustrations each, but that this cannot be done until authorized by special legislative act. It is not improbable, therefore, that the present volume will be the last of the series.

Mr. Worthen's chapter, of fifty-one pages, on economic geology, treats mainly of local sections in different parts of the state, principally of coal-measure strata. He announces the discovery of 'coal-oil' in the town of Litchfield, — a dense lubricating-oil, mingled with salt water, which he thinks comes from the base of the coal-measure conglomerate, or one of the upper Chester sandstones.

Four borings have reached the oil at a depth of nearly seven hundred feet, each boring yielding about two barrels of crude oil per day. He also reports the discovery of brine in Perry county. Six borings have been made, each flowing sixteen gallons a minute, from which an aggregate of thirty-five hundred barrels of salt is made annually.

The work on the fossil fishes by Orestes St. John and Mr. Worthen is a very important one, embracing two hundred and eight pages and twenty-six plates. It treats of those characteristic carboniferous families, the *Cochliodontidae* and *Psammodontidae*, and also of *Ichthyodorulites*. The important works on similar fossil fishes, which were published in previous volumes, are well known; and yet the material now published is unexpectedly comprehensive as regards the variety of forms